AMENDMENTS TO THE CLAIMS

The following listing of claims replaces all prior versions and listings in the application:

Listing of Claims

1. (Currently amended) A method of delivering combined positive and negative pressure assist ventilation to a patient, comprising:

detecting neural inspiratory activation of the patient;

applying a positive pressure to the patient's airways to inflate the patient's lungs;

applying a negative pressure around the patient's ribcage and/or abdomen in order to reduce a load imposed by the ribcage and/or abdomen on the patient's lungs; and

controlling application of the positive and negative pressures in response to the detected neural inspiratory activation of the patient;

wherein controlling application of the positive and negative pressures comprises controlling a level of the positive pressure applied to the patient's airways as a function of the detected neural inspiratory activation of the patient.

2. (Previously presented) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 1, wherein controlling application of the positive and negative pressures comprises synchronizing application of the positive and negative pressures.

3. (Original) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 1, comprising:

adjusting levels of the positive and negative pressures to avoid application of excessive positive pressure to the patient's airways and thereby minimize hemodynamic adverse effects.

4. (Cancelled)

5. (Previously presented) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 2, wherein synchronizing application of the positive and negative pressures comprises:

synchronizing triggering and termination of the application of the positive pressure to the patient's airways as a function of the detected neural inspiratory activation.

6. (Previously presented) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 1, wherein detecting neural inspiratory activation of the patient comprises detecting a level of neural inspiratory activation of the patient, and wherein controlling application of the positive and negative pressures comprises:

determining a target level of neural inspiratory activation of the patient;

comparing the detected level of neural inspiratory activation with the determined target level; and

controlling a level of positive pressure applied to the patient's airways as a function of the comparison.

7. (Previously presented) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 6, wherein controlling application of the positive and negative pressures comprises:

synchronizing triggering and termination of the application of the positive pressure to the patient's airways in relation to the detected level of neural inspiratory activation.

8. (Original) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 6, wherein controlling the level of positive pressure applied to the patient's airways comprises:

increasing the level of positive pressure applied to the patient's airways when the comparison indicates that the detected level of neural inspiratory activation of the patient is higher than the determined target level.

9. (Original) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 6, wherein controlling the level of positive pressure applied to the patient's airways comprises:

decreasing the level of positive pressure applied to the patient's airways when the comparison indicates that the detected level of neural inspiratory activation of the patient is lower than the determined target level.

10. (Original) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 6, wherein controlling the level of positive pressure applied to the patient's airways comprises:

maintaining a present level of positive pressure applied to the patient's airways when the comparison indicates that the detected level of neural inspiratory activation of the patient is equal to the determined target level.

11. (Previously presented) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 1, wherein applying a negative pressure around the patient's ribcage and/or abdomen comprises:

applying a constant negative pressure around the patient's ribcage and/or abdomen during patient's inspiration.

12. (Previously presented) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 2, wherein synchronizing application of the positive and negative pressures comprises:

synchronizing triggering and termination of the application of negative pressure with triggering and termination of the application of positive pressure.

13. (Previously presented) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 1, wherein controlling application of the positive and negative pressures comprises:

controlling a level of the negative pressure applied around the patient's ribcage and/or abdomen as a function of the detected neural inspiratory activation.

14. (Original) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 1, wherein applying a negative pressure around the patient's ribcage and/or abdomen comprises:

determining a target level of an abdominal pressure swing of the patient;

detecting a level of abdominal pressure swing of the patient;

comparing the detected level of abdominal pressure swing with the determined target level; and

controlling a level of negative pressure applied around the patient's ribcage and/or abdomen as a function of the comparison.

15. (Original) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 14, wherein controlling the level of negative pressure applied around the patient's ribcage and/or abdomen comprises:

increasing the level of negative pressure applied around the patient's ribcage and/or abdomen when the comparison indicates that the detected level of abdominal pressure swing of the patient is higher than the determined target level.

16. (Original) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 14, wherein controlling the level of negative pressure applied around the patient's ribcage and/or abdomen comprises:

decreasing the level of negative pressure applied around the patient's ribcage and/or abdomen when the comparison indicates that the detected level of abdominal pressure swing of the patient is lower than the determined target level.

17. (Currently amended) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 14, wherein controlling the level of negative pressure applied around the patient's ribcage and/or abdomen comprises:

maintaining a present level of negative pressure applied around the patient's ~~ribeage~~ ribcage and/or abdomen when the comparison indicates that the detected level of abdominal pressure swing of the patient is equal to the determined target level.

18. (Original) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 1, further comprising applying a constant Negative End-Expiratory Pressure over the abdomen to adjust an end-expiratory lung-volume.

19. (Original) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 18, comprising applying the constant Negative End-Expiratory Pressure over the abdomen in combination with inspiratory negative pressure assist ventilation.

20. (Original) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 18, comprising applying the constant Negative End-Expiratory Pressure over the abdomen in proportional response to tonic inspiratory muscle activation occurring during expiration.

21. (Original) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 1, wherein applying a negative pressure comprises obtaining an intrathoracic pressure estimate by measuring an airway pressure deflection during a patient's airway occlusion.

22. (Original) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 21, wherein, in case of intrinsic PEEP, obtaining an intrathoracic pressure estimate includes an extrapolation for the period between an onset of electrical activity of the patient's diaphragm activity and an onset of the patient's airway pressure deflection.

23. (Currently amended) A system for delivering combined positive and negative pressure assist ventilation to a patient, comprising:

a sensor of neural inspiratory activation of the patient;

a positive pressure ventilator connected to the patient's airways for applying a positive pressure to the patient's airways to inflate the patient's lungs;

a negative pressure ventilator installed on the patient's ribcage and/or abdomen for applying a negative pressure around the patient's ribcage and/or abdomen in order to reduce a load imposed by the ribcage and/or abdomen on the patient's lungs; and

a controller connected to the sensor of neural inspiratory activation and to the positive and negative pressure ventilators for controlling application of the positive and negative pressures in response to the neural inspiratory activation detected by the sensor;

wherein the controller is responsive to the neural inspiratory activation detected by the sensor to control a level of positive pressure applied by the positive pressure ventilator.

24. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 23, wherein the controller synchronizes operation of the positive and negative pressure ventilators to synchronize application of the positive pressure to the patient's airways and the negative pressure around the patient's ribcage and/or abdomen.

25. (Cancelled)

26. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 23, comprising:

means for determining a target level of neural inspiratory activation of the patient;

wherein the sensor detects a level of neural inspiratory activation of the patient; and

wherein the controller comprises a comparator of the detected level of neural inspiratory activation with the determined target level to control the positive pressure ventilator in relation to this comparison.

27. (Original) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 23, wherein the controller controls the negative pressure ventilator to apply a constant negative pressure around the patient's ribcage and/or abdomen during patient's inspiration.

28. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 23, wherein the controller is responsive to the neural inspiratory activation to control the negative pressure ventilator.

29. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 23, comprising:

means for determining a target level of an abdominal pressure swing of the patient; and

a sensor of a level of abdominal pressure swing of the patient;

the controller comprising a comparator of the sensed level of abdominal pressure swing with the determined target level to control the negative pressure ventilator as a function of the comparison.

30. (Currently amended) A system for delivering combined positive and negative pressure assist ventilation to a patient, comprising:

means for detecting neural inspiratory activation of the patient;

first means for applying a positive pressure to the patient's airways to inflate the patient's lungs;

second means for applying a negative pressure around the patient's ribcage and/or abdomen in order to reduce a load imposed by the ribcage and/or abdomen on the patient's lungs; and

means connected to the first and second pressure applying means for controlling application of the positive and negative pressures in response to the detected neural inspiratory activation;

wherein the means for controlling are responsive to the detected neural inspiratory activation to control a level of positive pressure applied by the positive pressure ventilator.

31. (Cancelled)

32. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 23, comprising:

means for adjusting levels of the positive and negative pressures to avoid application of excessive positive pressure to the patient's airways and thereby minimize hemodynamic adverse effects.

33. (Currently amended) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 23, wherein the [[the]] controller controls application of the positive pressure to the patient's airways as a function of the detected neural inspiratory activation.

34. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 33, wherein the controller synchronizes triggering and termination of the application of the positive pressure to the patient's airways as a function of the detected neural inspiratory activation.

35. (Cancelled)

36. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 26, wherein the controller increases a level of positive pressure applied to the patient's airways when the comparison indicates that the detected level of neural inspiratory activation of the patient is higher than the determined target level.

37. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 26, wherein the controller decreases a level of positive pressure applied to the patient's airways when the comparison indicates that the detected level of neural inspiratory activation of the patient is lower than the determined target level.

38. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 26, wherein the controller maintains a present level of positive pressure applied to the patient's airways when the comparison indicates that the detected level of neural inspiratory activation of the patient is equal to the determined target level.

39. (Cancelled)

40. (Currently amended) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 23, wherein the controller synchronizes triggering and

termination of the application of negative pressure with triggering and termination of the application of positive pressure.

41. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 23, wherein the controller controls a level of the negative pressure applied around the patient's ribcage and/or abdomen as a function of the detected neural inspiratory activation.

42. (Cancelled)

43. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 29, wherein the controller increases a level of negative pressure applied around the patient's ribcage and/or abdomen when the comparison indicates that the sensed level of abdominal pressure swing of the patient is higher than the determined target level.

44. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 29, wherein the controller decreases a level of negative pressure applied around the patient's ribcage and/or abdomen when the comparison indicates that the sensed level of abdominal pressure swing of the patient is lower than the determined target level.

45. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 29, wherein the controller maintains a present level of negative pressure applied around the patient's ribcage and/or abdomen when the comparison indicates that the sensed level of abdominal pressure swing of the patient is equal to the determined target level.

46. (Previously presented) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 23, further comprising means for applying a constant Negative End-Expiratory Pressure over the abdomen to adjust an end-expiratory lung-volume.

47. (Original) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 46, wherein the constant Negative End-Expiratory Pressure applying means comprises means for applying the constant Negative End-Expiratory Pressure over the abdomen in combination with inspiratory negative pressure assist ventilation.

48. (Original) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 46, wherein the constant Negative End-Expiratory Pressure applying means comprises means for applying the constant Negative End-Expiratory Pressure over the abdomen in proportional response to tonic inspiratory muscle activation occurring during expiration.

49. (Original) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 30, wherein the means for applying a negative pressure comprises means for obtaining an intrathoracic pressure estimate by measuring an airway pressure deflection during a patient's airway occlusion.

50. (Currently amended) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 49, wherein, in case of intrinsic PEEP, the intrathoracic pressure estimate obtaining means comprises means for conducting an extrapolation of the intrathoracic pressure estimate for the period between an onset of electrical activity of the patient's diaphragm ~~activity~~ and an onset of the patient's airway pressure deflection.

51. (New) A method of delivering combined positive and negative pressure assist ventilation as defined in claim 1, wherein the negative pressure is further controlled in response to a measured abdominal pressure of the patient.

52. (New) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 23, comprising:

a pressure sensor for measuring an abdominal pressure of the patient;

wherein the controller further controls the negative pressure in response to a measured abdominal pressure of the patient.

53. (New) A system for delivering combined positive and negative pressure assist ventilation as defined in claim 30, comprising:

means for measuring an abdominal pressure of the patient; and

means for further controlling application of the negative pressure in response to the measured abdominal pressure.